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(54) **Method for producing an improved layer, particular for a drill bit.**

(57) Process for producing an article, e.g. a drill bit, wherein a first layer (4) of powder material is applied to a core member (3) by cold isostatic compacting and subsequent sintering, and a second, exterior layer (5) is then applied by thermal spraying followed by hot isostatic compacting. The powder material of the first layer (4) may be a nickel-containing alloy steel powder.

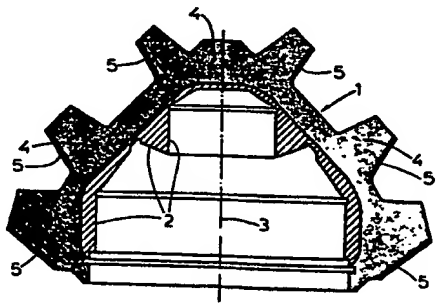

fig.1

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Method for producing an object on which an exterior layer is applied by thermal spraying and object, in particular a drill bit, obtained pursuant to this method.

The invention relates to a method for producing an object on which an exterior layer is applied by thermal spraying, followed by a heat treatment, and to an object, in particular a drill bit, obtained pursuant to this method.

Such a method is disclosed in British Patent 1,367,762. In application of the method described above to objects wherein it is required that the exterior layer applied be capable, in operation, of withstanding great variable forces, for example, that it must be resistant to wear, however, it happens that this layer sometimes chips off, thus shortening the life of the object obtained.

The invention accordingly procures a method of the type mentioned at the beginning, characterized in that on a core member is applied, by cold isostatic compacting, a layer of a suitable powder material, followed by sintering, after which the exterior layer, which is a wear-resistant layer, is applied and then the structure thus obtained is isostatically compacted hot.

It has been found that a suitable powder material for this purpose is a nickel-containing alloy steel powder with preferably 3.5% nickel therein.

The invention in addition procures a drill bit with cutting teeth provided with a wear-resistant layer, for drilling in rock.

For the performance of a method pursuant to the invention a supply of powder material is introduced into a rubber mold and distributed, after which the core member, which is usually a type of steel suitable for a bearing, is placed in the powder, following which the powder is pressed on. The core member may alternatively be placed in the mold first, after which the powder material is introduced and pressed on. The mold is closed and is then isostatically compacted cold until a coherent member having a density f approximately 90% is obtained. The compact removed

from the mold is then sintered in a furnace. After c oling the sintered object is coated with a wear-resistant layer by thermal spraying, for example plasma spraying, after which the structure thus obtained is isostatically compacted hot. This hot isostatic compacting may be done by inserting the entire object in a thin-walled deep-drawn vessel or container of low-carbon steel having a wall thickness of approximately 0.5 mm, filled with a ceramic powder. This vessel is then heated and placed under pressure on all sides. After hot isostatic compacting the object may be readily separated from the surrounding ceramic mass and cleaned by sand blasting. This method proves to procure components with accurately shaped dimensions comparable to those of a forged product.

When a drill bit for rock is produced in this fashion, after sintering not the entire surface of the cutting teeth but only the parts thereof which come directly into contact with the rock are coated with the wear-resistant layer by thermal spraying. Following the selective application of the wear-resistant layer the preformed drill bit is subjected in its entirety to hot isostatic compacting, as described above.

The invention is now explained in greater detail by means of the accompanying drawing, which represents a preferred embodiment of the invention.

Fig. 1 is a cross section of a drill bit produced according to the invention.

Fig. 2 is a perspective view of a portion of this drill bit.

The drill bit 1 shown in Fig. 1 is composed of a core member 3 , made of a bearing material, in which are applied the races 2 for the folling elements(not shown). On this core member 3, solid at the beginning, is applied, in a rubber mold, a layer 4 of powder, which combination is isostatically compacted cold. This operation takes place preferably under a pressure of approximately 6000 atmospheres at room temperature. Then the preformed drill bit, isostatically compacted cold, is removed from the mold and sintered in a sintering furnace at a temperature f approx. 1200°C

at 1 atmosphere under reduction by hydrogen for approx. 1 hour, which operations lead to a density of approx. 90% of the compacted material. Then, by means of plasma spraying technique, the wear-resistant layer 5 is applied on the layer 4 and the object obtained is then inserted into a vessel or container and isostatically compacted hot under a pressure of for example approx. 1600 atmospheres and at a temperature of approx. 1100°C for at least 2 hours. This operation results in a density of the layers 4 and 5 of 99% and a very solid bond between the layers.

It will be found by the method pursuant to the invention that the mechanical properties of the drill bit thus formed are greatly improved, like the bond between the layers 4 and 5, on the one hand, and the layer 4 and the core member 3, on the other. By this means the desired effect of very high resistance to wear and resistance to chipping of the cutting teeth is obtained, combined with a core member which functionally has other possible applications, such as, for example, the function of a bearing.

It is noted that the original solid core member 3, after mechanical operations and heat treatment, acquires the shape, as represented in Fig. 1, in which the races 2 of the rolling elements are supplied.

It may be seen further from Fig. 2 that not the entire surface of the cutting teeth of the drill bit is provided with the wear-resistant layer 5, but that the wear-resistant layer is applied only on the places where the tooth comes directly into contact with rock during operation.

Thus there is procured by the invention a device, such as a drill bit, which in principle consists of three parts, namely, a significantly improved cutting part 5, a supporting part 4 and a core or bearing part 3, which parts are combined in an economically and technically advantageous manner such that the said drill bit satisfies the requirements set.

Claims

1. Method for producing an object on which an exterior layer is applied by thermal spraying, followed by a heat treatment, characterized in that on a core member (3) is applied, by cold isostatic compacting, a layer (4) of a suitable powder material, followed by sintering, after which the exterior layer (5), which is a wear-resistant layer, is applied and the structure thus obtained is then isostatically compacted hot.

2. Method according to claim 1, characterized in that the powder material of layer (4) is a nickel-containing alloy steel powder.

3. Method according to claim 2, characterized in that the steel powder contains 3.5% nickel.

4. Method according to claims 1-3, characterized in that after sintering of the powder material the wear-resistant layer (5) is sprayed only on the surfaces which in operation are directly subject to wearing action.

5. Method according to claims 1-4, characterized in that the core member (3) consists of a bearing material.

6. Object obtained according to the method of claims 1-5.

7. Drill bit with cutting teeth provided with a wear-resistant layer for drilling in rock, characterized in that on a core member (3) functioning as bearing is applied a layer (4) obtained by cold isostatic compacting and sintering of a suitable powder material, the cutting teeth of which are provided with the wear-resistant layer (5) on the places where the teeth in operation come into direct contact with the rock and the preformed drill bit is isostatically compacted hot in its entirety, such that a bond is established between the layers (4) and (5), on the one hand, and between the layer (4) and core member (3), on the other.

8. Drill bit according to claim 7, characterized in that the layer (4) consists of a nickel-containing all y steel.

9. Drill bit according to claim 7 or 8, characterized in that the nickel-containing alloy steel contains 3.5% nickel.

10. Drill bit according to claims 7-9, characterized in that the original solid core member (3) is formed by mechanical operations and heat treatment into a bearing for the bearing system of the drill bit.

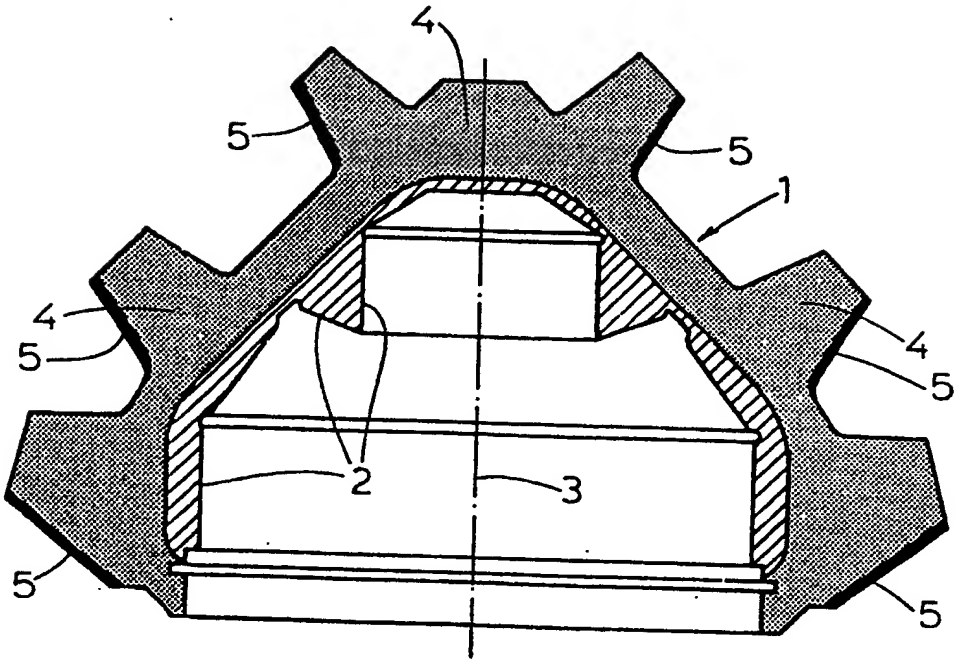

fig.1

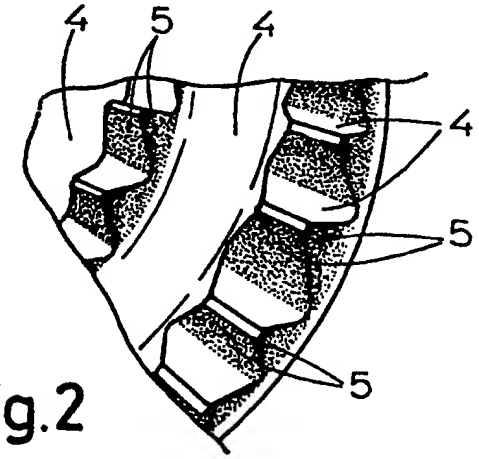

fig.2

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 80 20 1107

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
	EP - A - 0 005 285 (SKF) * Claims 1,9; figure 1 * & NL - A - 78 04454 --	1,6,7
	FR - A - 1 434 158 (SOCIETE DE FABRICATION D'ELEMENTS CATALYTIQUES) * Abstract 4; pages 2,3; example 2 * --	1,6
A	NL - A - 77 03 234 (SKF)	
A	US - A - 3 882 581 (C.E. MERENESS) & FR - A - 2 263 991	
A	NL - A - 54 863 (MEUTSCH, VOIGTLANDER & CO.)	
A,D	GB - A - 1 367 762 (ASSOCIATED ENGINEERING LTD.) ----	

CLASSIFICATION OF THE APPLICATION (Int. Cl.³)

B 22 F 7/06
C 23 C 7/00
E 21 B 10/52

TECHNICAL FIELDS SEARCHED (Int. Cl.³)

B 22 F
C 23 C
E 21 B

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	09-03-1981	SCHRUERS

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